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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/823,018	03/30/2001	Gene E. Lightner		8351

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EXAMINER

DUONG, THANH P

ART UNIT PAPER NUMBER

1764

DATE MAILED: 06/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/823,018

Applicant(s)

LIGHTNER, GENE E.

Examiner

Tom P Duong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 March 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 7-9, and 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (3,699,218) in view of Clawson et al. (6,641,625) and Jossen et al. (6,228,254). Regarding claims 1 and 7, Smith discloses a method of producing hydrogen (drawing) comprising: producing a vapor containing hydrocarbon and water vapor (steam) and subjecting said vapor to a catalytic reformer (hydrogen generation zone 4) to produce a gas containing hydrogen and carbon monoxide (Col. 1, lines 29-34), subjecting the previously reformed gas containing hydrogen and carbon monoxide to catalytic steam shifting (shift conversion zone 8) to substantially convert said carbon monoxide to carbon dioxide (absorption zone 24), scrubbing (adsorption zone 28) the previously reduced sensible heat steam shifted gas (drawing, line 10) containing hydrogen and remaining carbon monoxide, from steam shifting, in a solvent (Col. 6, lines 17-21) capable of dissolving carbon monoxide to form a solvent containing dissolved carbon monoxide and a gas containing hydrogen substantially devoid of carbon monoxide (Col. 5, lines 31-37), and separating (by absorption zone 28) the previously scrubbed gas containing hydrogen substantially devoid of carbon monoxide

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from the solvent (Col. 6, lines 17-21) containing dissolved carbon monoxide thereby producing a gas containing hydrogen substantially devoid of carbon monoxide. Smith fails to disclose a vaporizing said hydrocarbon and water from sensible heat of the previously steam shifted gas containing remaining carbon monoxide to form hydrocarbon vapor and water vapor to form steam shifted gas reduced sensible heat. Clawson teaches the reformat may not be of the quality to be transferred to the PrOX reactor 12 and the fuel cell 15 (Col. 9, lines 29-31) during initial start-up; therefore, it is desirable to preheat the feedstock prior to feeding to the reformer. Clawson teaches the importance of preheating fuel by a shift catalyst bed (Col. 9, lines 10-16) and preheating water by shift catalyst beds (Col. 9, lines 45-54) in order to improve the quality of the reformat prior to feeding to the PrOX. Thus, it would have been obvious in view of Clawson to one having ordinary skill in the art to modify the reforming method of Smith with the step of preheating the feedstock as taught by Clawson in order to improve the quality of the reformat for the PrOX. Smith discloses the reforming of a general hydrocarbon but fails to disclose the reforming of specific hydrocarbon of volatile heterocyclic compounds. Jossens specifically teaches the reforming (Col. 1, lines 11-14) of a gasoline containing heterocyclic compounds to produce conventional syn gas. Thus, it would have been obvious in view of Jossens to one having ordinary skill in the art to modify the reforming method of Smith by reforming hydrocarbon including heterocyclic compounds to provide an alternative fuel source to power a fuel cell. With respect to claim 7, Smith shows the absorption of carbon dioxide prior to the absorption of carbon monoxide while Applicant shows the removal of carbon monoxide

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prior to the removal of carbon monoxide. It would have been obvious in view of Smith to one having ordinary skill in the art to reverse the treatment of the absorption of carbon monoxide prior to absorption of carbon dioxide since the court held such reversal of parts is obvious and not patentability distinct (*See In re Gazda*, 219 F.2d 449, 104 USPQ 400 (CCPA 1955). Regarding claims 8-9, Smith discloses the solution (acts as solvent) capable of removal carbon dioxide selected from aqueous salts (Col. 5, lines 48-52). Regarding claim 12, Smith discloses all the limitations and further discloses a the use of charcoal as the adsorbent for carbon monoxide (Col. 6, lines 17-20). Regarding claims 13-14, it would have been obvious in view Smith to one having ordinary that the amount of hydrogen gas produce and/or the fuel needed to be reformed by hydrogen manufacturer is based on the demand and/or supply from consumers. Regarding claim 15, the above applied references disclose all the limitations as described in claim 1 and Clawson further discloses the importance of preheating the feedstock (water and fuel) by shift reactors prior to feeding to the reformer so that the temperature in the reformer can be controlled properly in order to produce a quality reformat for fuel cell (Col. 9,lines 10-54). Thus, it would have been obvious in view of Clawson to one having ordinary skill in the art to preheat the feedstock as taught by Clawson for hydrogen production method of the applied references so that the temperature of the feedstock and reformat can be controlled properly to produce a high purity hydrogen. Regarding claim 16, Clawson discloses some of the catalysts used in the reformer (Col. 12, lines 1-8) and the some of the

catalysts used in the shift reactor (Col. 13, lines 5-12) are the same. Therefore, the catalysts are combinable.

2. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over applied references (Smith et al. '218 in view of Clawson et al. '625 and Jossen et al. '254) as applied to claim 1 above, and further in view of Golden et al. (5,531,809) and admitted prior art (Admission). The applied references in claim 1 fail to disclose the use of solvent containing cuprous chloride in HCL. Golden teaches the use of such solvent (Col. 4, lines 12-18) to recover carbon monoxide from a reforming process (Col. 1, lines 5-22). Admission also discloses (specification, page 3, lines 6-13) that it is conventional to use organic solvent such as cuprous chloride in HCL or inorganic solvent such as ethyl acetate and acetic acid as a method of removing or dissolving carbon monoxide. Thus, it would have been obvious in view of Golden and Admission to one having ordinary skill in the art to modify the method of removing carbon monoxide in the above applied references with a cuprous chloride in HCL solvent as taught by Golden and/or ethyl acetate and acetic acid as taught by Admission in order to facilitate recovery and/or dissolving of carbon monoxide.

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over applied references (Smith et al. '218 in view of Clawson et al. '625 and Jossen et al. '254) as applied to claim 1 above, and further in view of Vidalin (6,599,491). The applied references in claim 1 disclose all the limitations except carbon monoxide to be recycled for additional steam shifting. Vidalin '491 teaches the separated carbon monoxide (30) is recycled back to the CO shift converter (21) to enhance the hydrogen production

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(Abstract). Thus, it would have been obvious in view of Vidalin to one having ordinary skill in the art to modify the method of producing hydrogen of the applied references with the carbon monoxide recycled stream as taught by Vidalin in order to enhance hydrogen production.

4. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over applied references (Smith et al. '218 in view of Clawson et al. '625 and Jossen et al. '254) as applied to claim 7 above, and further in view of Fuderer (4,553,981). The applied references fail to disclose the means for separating the carbon dioxide from the separated solution containing carbon dioxide and recycle the separated carbon dioxide to the system. Fuderer teaches the carbon dioxide waste gas can be separated in the separation tank 5 and the regenerated absorber liquid is returned to the scrubbing means 7 for continuous use of scrubbing the carbon dioxide. Thus, it would have been obvious in view of Fuderer to one having ordinary skill in the art to modify the hydrogen method of the applied references with a solution of capable separating the carbon dioxide from the absorber liquid as taught by Fuderer so that the absorber can be regenerated with scrubbing liquid.

5. Claims 6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over applied references (Smith et al. '218 in view of Clawson et al. '625 and Jossen et al. '254) as applied to claim 7 above, and further in view of Lin et al. (6,207,132). The applied references disclose all the limitations except the supplied hydrogen (free of carbon monoxide) is used to power the fuel cell located within a vehicle. Lin teaches the hydrogen generate from the steam-reforming process can be used to power the fuel

cell for electric vehicles or onsite electric power plants. Thus, it would have been obvious in view of Lin to one having ordinary skill in the art to modify the production hydrogen method of the applied references with supplying hydrogen means to the fuel cell within a vehicle as taught by Lin in order to provide hydrogen as a fuel source to power the vehicle.

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over applied references (Smith et al. '218 in view of Clawson et al. '625 and Jossen et al. '254) as applied to claim 1 above, and further in view of Lightner (6,007,636). The applied references fail to disclose the volatile heterocyclic compounds are provided by acidic hydrolysis within a biomass. Lightner '636 teaches the heterocyclic compounds can be formed from acidic hydrolysis of biomass and the heterocyclic compounds can be used as an alternative fuel source in lieu of petroleum crude oil (Col. 1, lines 6-30). Thus, it would have been obvious in view of Lightner to one having ordinary skill in the art to modify the hydrogen production method of the applied references with the formation of heterocyclic compounds from acidic hydrolysis of biomass to be used as an alternative fuel source in lieu of crude oil as liquid fuel.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom P Duong whose telephone number is (571) 272-2794. The examiner can normally be reached on 8:00AM - 4:30PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tom Duong
May 27, 2004

TD



Alexa Doroshenko
Patent Examiner
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